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WASHINGTON UNIVERSITY

WINTER 1966

THE PATIENT Whose
DATA IS Desired
IS CODED AS FOLLOWS
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For a long time field trips have been a part of the education experience of most students. In one instance this fall, however, the "field" came to the campus.

A standing-room-only crowd of students, faculty, school children, and other interested citizens filled Graham Chapel on December 16, to witness a naturalization ceremony for fifty foreign-born St. Louis area residents.

An obliging Judge Roy W. Harper (left) moved his court from downtown, federalized the Chapel, and, after the oath of citizenship (below), welcomed the new citizens to their adopted land.

Movement of the court to the campus was prompted by an expression of interest by a group of foreign students at the University. The WU Women's Society and a number of student organizations assisted with arrangements for the dramatic occasion.
COVER: Control Panel of the LINC digital computer apparatus set up at University hospital to detect and enhance heart signals of the unborn child. See "Fetal Heartbeat," beginning on Page 2.

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Important research and clinical information is being discovered in experiments being conducted jointly by scientists of the University's Biomedical Computer Laboratory and School of Medicine, who are using the LINC computer to detect and enhance heartbeat signals of the unborn child.

FETAL HEARTBEAT

By FRANK O'BRIEN

The electrocardiograph, a device for recording the electrical signal created by the heart muscle, had its beginnings about one hundred years ago. The first electrocardiograph was a frog's leg placed on the exposed, beating heart of a turtle. With each beat of the heart, the frog's leg contracted and kicked.

In the intervening years, the technique has become somewhat more sophisticated. The electrical energy associated with the heartbeat is detected by electrodes placed on the patient's body, the impulses are amplified, and the record is automatically traced on graph paper. Today's physician can read an electrocardiogram like a book and can deduce from it a mine of information about the heart.

In 1906, Dr. Max Cremer of the University of Munich was studying the electrocardiogram of a pregnant woman when he noted tiny breaks in the baseline, occurring at regular intervals and at a faster rate than the mother's heartbeat. Cremer deduced that the small, fast breaks were caused by the heartbeat of the unborn child, or fetus, in the mother's uterus. Other investigators continued to record similar signs in pregnant women, but as late as the middle twenties there were many skeptics who refused to believe that the signals came from the fetus. In fact, some investigators claimed that they could get similar readings from the male.

Today, fetal electrocardiography is an established laboratory procedure. By correctly placing electrodes on the mother's abdomen, the investigator can get readings that show not only the mother's electrocardiogram, but also the fainter, faster tracings of the unborn child's.

The advantages of being able to observe and record the fetal heart signal are obvious. It may give the cardiologist invaluable information about the development of the heart, provide the obstetrician with a new method of detecting fetal life and a way of keeping constant check on the progress of the pregnancy, and enable the pediatrician to extend his observations back months before birth to create a whole new field of "antenatal pediatrics."

The problem, however, has been that even with the most sensitive modern equipment it has been extremely difficult to get a clear and complete fetal signal, mainly because the mother's signal drowns out the fainter fetal record. Any attempt to amplify the total signal merely increases the maternal and fetal signals alike.

About two years ago, Milton H. Hieken, a Washington University graduate student, was discussing his work with a member of the University's Obstetrics and Gynecology Department, Dr. Alfred Sherman. Hieken, who was working toward his master's degree at the University's Department of Electrical Engineering at the time, was telling Dr. Sherman of the exciting work being done on many problems in medicine and biology with the LINC computer. The LINC (an acronym for Laboratory Instrument Computer) is a small, compact, digital computer especially designed for use in the biology laboratory, where there is a need for close association of the investigator with both the computer and other experimental equipment.

Like other digital computers, the LINC can perform elementary arithmetic and logic operations at extremely high speed, and can follow a program of instructions from a stored memory. Unlike conventional digital computers, the LINC works in what the engineers call "real time" or "on-line"; it works directly on a problem as it develops and can respond to changes in the input as they occur. An integral part of the LINC is an oscilloscope that permits the investigator to see his results as they occur and to create and modify simulated models of solutions at will.
Technician Marianne Tinnell and Dr. Remsen Behrer, associate professor of pediatrics, check electrocardiograph leads on patient's abdomen. The electrical signals obtained are fed into a LINC digital computer in the adjoining room.
The problem, while difficult to solve, was simple to state: How to use the unique capabilities of the LINC computer to detect and enhance the fetal EKG to the point where important research and clinical information could be derived from it. Other investigators have used computers on this problem, but they have employed large digital machines for analyses of EKG recordings. The Washington University team is the first to attempt to use the LINC computer as a part of a complete experimental apparatus working "on-line" with the patient.

To gather data, the experimental apparatus has been set up in the Obstetrics and Gynecology clinic of Wohl Hospital in the Washington University Medical Center. One room is used for the patient and an adjacent small room houses the computer and allied equipment.

The first step in the process is to determine the exact maternal heartbeat in each patient examined. The time of occurrence of this signal is obtained from shoulder leads, with the electrical impulses picked up by the electrodes being fed into a conventional electrocardiograph and also onto tape. Readings are taken simultaneously from electrodes placed on the mother's abdomen.

The computer then performs weighted averages of the maternal heartbeat signal as it appears on the abdomen and subtracts the weighted average from the total abdominal signal. The investigator then has a signal from which the maternal heartbeat has been eliminated, leaving only the fetal heartbeat and "noise." The noise that comes from the mother's respiratory action and muscular movement, plus a certain amount of electrical interference, must then be reduced by various filters, "backward averaging techniques," and statistical analyses. The LINC apparatus is able to produce a running visible record on the oscilloscope, as well as permanent records such as graph-paper tracings, oscilloscope photographs, and magnetic tapes which can be used for later processing or study.

An important part of the investigation is the attempt to establish normal patterns of fetal EKG activity against which pathological behavior can be measured. All of the data being gathered in this project are recorded on tape for later comparison, and the records being accumulated will, it is hoped, establish accurate parameters for future investigation.

To provide other comparative data, Dr. Behrer and Glaeser are planning an experiment to compare readings made on the abdominal surface with direct readings from the fetal heart. Using experimental animals, they hope first to take readings on the animal's abdomen, then to open the abdominal wall and record on the uterus, and finally to open the uterus and record directly on the fetus. By comparing the records, they hope to learn a great deal about what happens to the heart signal on its passage from the fetus to the surface of the mother's abdomen.

The use of digital computers to help solve problems in biology and medicine is comparatively new, and is an area in which Washington University is one of the leaders. The Biomedical Computer Laboratory is currently working on dozens of problems in collaboration with the School of Medicine, the University's science departments, and other community research centers. The laboratory works closely with an allied organization, the University's Computer Research Laboratory, a research center built around the team of scientists who originally designed the LINC and are now engaged in the design and development of new computers and computer techniques for use in the biomedical field.

Among the many projects on which the Biomedical Computer Laboratory is working is a study of the theories and models of the mechanical action of the cochlea of the ear, in cooperation with the Central Institute for the Deaf. The LINC's unique properties make it possible to simulate models mathematically and to test them against data from living systems. The laboratory is also collaborating with medical researchers on problems involving radiotherapy treatment planning, infant vectorcardiography, cardiac arrhythmia, insulin response, enzyme molecule interactions, brain and neural wave patterns, and other areas of pure and applied research.

The fetal electrocardiograph experiments have two main objectives: learning more about the heart, how it develops, and when and how its electrical activity begins; and developing practical, clinical techniques to help reduce the number of abortions, stillbirths, and damaged babies.

There exists, without question, a point in fetal develop-
As a pediatrician with a strong interest in infant cardiology, Dr. Behrer has worked closely with the Biomedical Computer Laboratory on studies of the fetal heart signal, using the LINC computer.

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Members of the fetal EKG research team at the control panel of the LINC computer apparatus. From left: Jerome R. Cox, Jr., director of the Biomedical Computer Laboratory; Don Glaeser, research assistant in the Laboratory, and Dr. Behrer of the School of Medicine.

An electrocardiogram is taken on a newborn baby in the St. Louis Maternity Hospital nursery. Stephen Van Meter, Washington University medical student, is checking the leads. Fetal electrocardiography can develop techniques to help reduce the number of abortions, stillbirths, and damaged babies.
This fall Vice President Humphrey came to Washington University to give the first Benjamin E. Youngdahl Lecture. The new lectureship was established in honor of Benjamin E. Youngdahl, first dean of the University's George Warren Brown School of Social Work and one of the recognized leaders in the social work field throughout the nation.

In his address, the Vice President emphasized that public welfare must seek to strengthen and preserve the family unit and that the heart of the War on Poverty must be the preservation of human dignity.
GOVERNMENT
AND
SOCIAL WELFARE

AS I WAS PREPARING this lecture and thinking of my old friend Ben Youngdahl, there came to my mind the well-known lines of the British poet Stephen Spender:

I think continually of those who were truly great.
The names of those who in their lives fought for life,
Who wore at their hearts the fire's center . . .
Born of the sun they traveled a short while toward the sun,
And left the vivid air signed with their honor.

As I leaf through the many addresses and papers Ben Youngdahl has presented in his professional field, I find again and again the depth of his belief in the dignity of man.

In 1949 Ben Youngdahl wrote: "A recipient of public assistance is still a citizen and a person with all the rights and dignity given to all people in our democracy."

In 1952 he said: "Regardless of what programs we espouse or administer, the end result in our minds is always the person, supreme, divine."

In 1963 he sounded a note of impatience. He said: "It's about time we shake loose from the time-worn assumption that people who are compelled to receive public assistance are necessarily immoral or weak."

The words of Ben Youngdahl have been words of common sense and responsibility—and concern for his fellow man. They have been words taking into account the fact that, in our complex modern society, the individual is precious.

Lately we have become concerned—and rightly so—about the condition of the Negro family. Statistics tell us that almost a quarter of such families are headed by a woman. In many other families, where the husband is present, he is unemployed while the wife goes to work.

The social scientists, therefore, say that in much of the Negro community, and particularly in the cities, a kind of matriarchy prevails.

We urgently need to reinforce the fragile structure of the Negro family—particularly by opening up more and better jobs for Negro men, so that they can be respected and self-respecting breadwinners for their own families.

But there is another side to the picture. And it can be clearly seen in our American experience. Our Jewish fellow-citizens are mostly descended from penniless immigrants from the ghettos of Russia and Eastern Europe. Yet, in a generation or two, they have risen to outstanding achievement in business, in the professions, and in the academic world.

It is the tremendous pride of the Jewish mother in the educational and cultural achievements of her children that has made the difference—that has helped her children move out of the slums to a better life.

The Negro mother has had, in the past, a pretty realistic notion of the odds in our society against her children. Her aspiration has, typically, been a much more modest one—but in view of the odds, a brave and worthy one.

Often in the back pages of our newspapers there appears the story of a Negro couple who have attained their 50th wedding anniversary, or of a Negro woman who has reached the age of 100. This is their only opportunity to say to their fellow citizens what they consider most important in their lives. And, time after time, the mother will put it in some such phrase as this:

"I raised five children, and none of them got into trouble."

That is human dignity in its most basic form. If we can
cherish and maintain that dignity, we will have moved a long way toward keeping more children out of the courts and in the schools.

Incidentally, it is worth taking note of that word “trouble”—the thing that many Negro mothers are constantly afraid their children will get into, and from which they tirelessly, even desperately, seek to defend them.

It’s important to note that “trouble” is far more often in the world outside the family than in it. A child psychiatrist, Robert Coles, who has made a close study of many Negro families, makes this observation:

“...There are considerable strengths in the Negro family, psychological strengths that have enabled Negro children ... to survive ordeals that I frankly find it hard to imagine my children surviving.

“My observations convince me that the critical time for Negro children is the early teens when they face not the internal strain of the family but the external one of the outside world in all its clear-cut unfriendliness and rejection.”

Let us move from general principles to individual human experience.

Dr. Coles interviewed one Negro mother whose youngest son had just been graduated from high school with honors and a scholarship to college, while his two elder brothers had made messes of their lives. Here is what the mother had to say, in her own words:

“They say we’re lazy and we don’t pay much attention to the law, and sure enough I have two boys to prove it and one to disprove it, so it’s two to one against us in this family. But I’d like to tell people why I think my two boys went bad.

“I preached and hollered at all three the same. Those older boys were good boys just like the little one, and I remember when they wanted to study and be somebody, just like him. But they never had a chance. They were born too soon. That was it.

“They went to school until it didn’t make any sense to go there, because we had no money and they thought they should try to get jobs. So they left school and tried. They tried and tried and there wasn’t anything for them.

“Most people keep busy, so the time flies along and they don’t know what it is to just sit and feel useless ... I’ll tell you what happens, you just fold up and die.

“That’s what drugs and liquor mean. They mean you’ve died. I mean you have hung up on the world, because you keep on calling and there just ain’t no answer on the other end of the line. I watched my boys go bad like milk you know is standing too long. There’s no use for it, so it gets sour.

“Now, at least one is going to be all right. And I’ll tell you, it’s because he was born at the right time. I know it in my bones that he would have turned out just like the others, except for what’s happening now, with the integration and all that.

“He says he’s glad it happened to him, but he feels bad because people think he’s so special. But the truth is he was given a choice and his brothers weren’t, so he feels dishonest sometimes. But I tell him, it’s not you who are dishonest, son, it’s the world, and they are finally coming around to knowing it, so we should all thank God for that.”

There is a great deal of human dignity in those words—the kind of dignity we should maintain and nurture. Some of us have not in the past been as fully aware of the importance of human dignity as we might be—in spite of the forceful and persistent way in which Ben Youngdahl and others have kept reminding us.

Too often in the past we have overloaded caseworkers—so that, instead of being able to carry out their professional responsibilities for nurturing the dignity and self-respect of the recipient families, they have become mere conduits for public funds.

Worse still, there were some years ago insistent and indignant demands for the publication of the names of those who were receiving relief, in order to expose the “chislers.”

Now, I am the first to condemn the chiseler of public funds, whether he be in a high place or a lowly one. But this would have been the worst way of going about exposing chislers on relief. It would have humiliated 999 honest but unfortunate citizens for every petty chiseler it turned up. That is not the way to enhance human dignity. It is a sure way to destroy it, and I am glad that we hear little of it nowadays.

In the past, also, there have been too many 3 a.m. gangbuster raids on recipients of Aid to Families with Dependent Children, to determine whether there was a man in the house.
I think these were disgraceful. There must be better ways of finding this out—if we must.

Fortunately, 1961 legislation made it possible for the states to give Aid to Families with Dependent Children where the father was present but unemployed.

I am glad to say that 18 of our states, mostly the more industrialized ones, are doing so. I hope that more states will follow their example, and also that the District of Columbia will. It certainly would if it had home rule, as our nation's capital should.

We must defend the human dignity of the recipients of relief, and we shall continue to do so. But I am glad to say that we have turned the corner, and are putting our major stress on positive steps to enhance dignity and self-respect—including getting those who are potentially employable off relief and into the mainstream of the American economy.

It's not only good morals, but good economic sense to turn a tax-eater into a taxpayer.

As many of you know, but too many Americans have forgotten, a major turn in this direction came with the passage of the Public Welfare Amendments of 1962—a program to change the whole direction of public welfare and place its emphasis upon prevention and rehabilitation.

The Congress then recognized that public welfare had to become more than a salvage operation confined to picking up the debris of human lives—that it had to become a positive, constructive force in society.

Public welfare must seek to strengthen and preserve the family unit. It must take a leading role in the attack on such problems as dependency, juvenile delinquency, family breakdown, illegitimacy, ill health, and disability. Unless we do deal with these problems, they tend to regenerate themselves from generation to generation, weakening the whole fabric of our society.

Last year the attack along this front was greatly broadened and strengthened with the launching, under President Johnson's leadership, of the war against poverty. Significantly, the major legislation supporting this war bears the name of the Economic Opportunity Act of 1964. That word “opportunity” is significant. The Great Society is not a welfare state—it is a state of opportunity. This war on poverty is something entirely new. It is experimental. It is controversial.

In discussion of the poverty program, there has been vigorous criticism of the welfare system and welfare administrators. Here is a sample from Joseph Kraft's widely syndicated column.

"The essence of the poverty program is that the regular welfare programs have long since been outmoded... and this whole outmoded system is sustained by a huge welfare bureaucracy that is committed heart and soul to doing exactly what it used to do."

Well, like public officials, welfare administrators are used to criticism. We both must take to heart President Truman's admonition: "If you can't stand the heat, stay out of the kitchen!"

But at least criticism today is coming from a new and rather refreshing direction. Instead of being criticized for doing too much, you are today criticized for doing too little. But criticism and self-criticism—painful as they may be—are good for any profession. And if that criticism is sometimes to the mark, it should be heeded.

Today there is room for everyone in the war against poverty—experienced welfare administrators and neophytes too. The important thing is that all who participate should devote most of their time and energy to fighting poverty, and not each other.

And there, Ben Youngdahl, I am sure we agree. It is a rare prophet who is honored in his own country. It is an even rarer prophet who sees his own prophecies coming true.

Ben Youngdahl, you are doubly fortunate, as you deserve to be. You are highly honored by your colleagues at this great university, and by the people of this state and this nation.

But, knowing you, I think that you derive a much deeper satisfaction from the knowledge that the gospel of human dignity which you have been preaching these many years—human dignity even for "the last, the lost, and the least," as you like to say—has not fallen on deaf ears. It has been the foundation stone of the society we Americans are building today.

I hark back to the words of the Negro mother, which I quoted earlier: "You keep on calling and there just ain't no answer on the other end of the line."

Now, thanks to you and to people like you, the whole American people are answering—late in the day perhaps, tragically too late for some, but—pray God—not too late for the many.

May the day be past when any child was born too soon. May the day be here when every child can step forth into life with his eyes upon the stars.
OPERA and the UNIVERSITY

The Opera Theatre of St. Louis, in cooperation with Washington University, launched its 1965-66 season this fall with an exciting presentation of *Cavalleria Rusticana*, starring Grace Bumbry.

The production illustrated the wedding of University and community resources that has made the Opera Theatre a unique institution during the three years of its existence.

Director and conductor was Harold Blumenfeld of the University's Department of Music, who is also artistic director of the organization. Edward Corn of the University's Performing Arts Office is business manager of the Opera Theatre; Chris Stafford of the School of Architecture is set designer; Juliette Reed of the School of Fine Arts is costume designer, and Annelise Mertz, associate professor of dance, is choreographer. Coordinating all these efforts for the *Cavalleria* was alumna Joan Block.

In the *Cavalleria*, as in former Opera Theatre productions, faculty members, students, and alumni filled many diverse roles in the cast, the chorus, and backstage. Even Grace Bumbry, back home after her triumphant introduction to the Metropolitan Opera this fall, once participated in a class for gifted high school students with Dr. Lewis B. Hilton of the Department of Music faculty.

The *Cavalleria* was followed in January with a presentation of Monteverdi's *The Coronation of Poppea*. This challenging work was given by Washington University's Opera Studio for the Opera Theatre, and featured 40 University singers, dancers, and instrumentalists.

The Opera Theatre and Studio are also collaborating on a greatly expanded educational program for public schools and a series of operatic performances for business, industrial, and civic groups.

Star of the Opera Theatre's recent production of *Cavalleria Rusticana* was Grace Bumbry, St. Louis-born soprano, who made her debut with the Metropolitan Opera this fall.
A scene from the *Cavalleria* on the stage of the American Theatre. Stage settings were the work of Chris Stafford of Architecture; costumes were designed by Juliette Reed of the School of Fine Arts.

Backstage at the opera. Members of the cast and chorus make up for their roles. Many students, faculty, and alumni participated behind the scenes, as well as on stage.
Director and Conductor Harold Blumenfeld of the Department of Music confers with two of the *Cavalleria* principals: Bob Brewster, who won rave notices when he took over the tenor lead at the last minute, and baritone Sam Timberlake. Both are graduate students with Leslie Chabay.
The concept of the “ether,” a subatomic medium filling all space, is a classic one in physics, although numerous experiments since the late 1800’s have failed to substantiate it. Recently, Dr. Peter R. Phillips, associate professor of physics, has developed a novel experiment to attempt to detect the ether through its magnetic effects. Born in Great Britain, Dr. Phillips graduated from Cambridge University and received his Ph.D. degree from Stanford University. He was with the Argonne National Laboratory outside Chicago before coming to the University in 1963. His current research is being supported by the National Science Foundation.

In Search of the Ether

Most people think of outer space as a void, save for meteors and space capsules. Whether there is such a thing as “empty space,” however, has been one of the most puzzling problems in the history of physics.

For several reasons, it is a question that has been neglected during the past fifty years or so. Next summer, a Washington University physicist, Dr. Peter Phillips, and two graduate students will attempt to determine whether there is a special medium which permeates all of space.

A number of physicists, including Dr. Phillips, believe that there may be. In theory, it should be a subatomic medium of extraordinary properties. Scientists call it the “ether.” It has never been detected, although painstaking experiments to do so have been attempted.

The word “ether” apparently was used first by Aristotle. He added to four earthly elements a fifth substance, or quintessence, which made up all the stars and heavenly bodies, and was perfect and incorruptible. He called it the “aether.” (In Greek mythology Aether was the son of the gods Darkness and Chaos.) The concept of its perfection lasted until Galileo’s discovery of sunspots in 1610. Decades later, Sir Isaac Newton discussed the notion of an ether in a much different sense, making the classical theoretical description of it in his work Principia Mathematica. Newton, and many physicists after him, felt that there should be a substance filling interstellar space, and even the space between the particles of all matter. The ether should be tenuous enough to allow matter to circulate freely through it and elastic enough to carry the vibrations of light and the force of gravity.

Physicists in the nineteenth century were hopeful that someone would offer proof of the ether’s existence, but it wasn’t until the latter part of the century that instrumentation was sufficiently refined to permit serious attempts to look for the ether.

In 1887, Albert A. Michelson and Edward W. Morley, of the Case Institute in Cleveland, carried out a classic experiment to detect the ether by studying the velocity of light. The reasoning behind the experiment was, very briefly: As the earth travels through the ether, the ether should impede the velocity of light in the direction of the earth’s course, in much the same way a boat is slowed as it travels upstream. Using an ingenious instrument of their own design, called an interferometer, they split a beam of light, sending one beam in the direction of the earth’s motion, and another at right angles to it. Michelson and Morley reasoned that when the two beams recombined, they should be out of step because of the impedance of the ether. But they were not. If there was an ether, it apparently did not affect the velocity of light. The experiment was repeated under various conditions by several investigators and the results were always negative. At this point, scientists began to doubt whether the ether was a detectable entity.

Albert Einstein assumed for the purpose of his calculations that the ether did not exist. His brilliant and unifying equations on the relationship of matter, energy, and light were worked out without considering the ether at all.

To many physicists the ether question was closed following the development of Einstein’s equations. Einstein’s theory had great simplicity and symmetry, and could stand without the ether, which, if introduced into the
Professor Phillips aligns parts of a vacuum system designed to evacuate the container holding the magnet used in his experiment.

Dorothy Woolom, graduate physics student, checks the clamp which secures the pendulum during transportation.
system, would present some theoretical difficulties. In addition, there were the negative results from numerous versions of the Michelson-Morley experiment.

But the question continued to nag at least a few scientists, including Professor Phillips when he was a graduate student at Stanford University. He did some research on the ether, but it was only a sideline to his main studies. After taking his Ph.D. in 1961 with a thesis on high-energy beams, he continued high-energy particle research, using the powerful accelerator at the Argonne National Laboratory near Chicago. But experimental physics in this field, for all its importance and fascination, often restricts the imagination of those who practice it, because of the great size of the equipment and the number of people involved. It is difficult for a researcher who is responsible for a complex experiment to arrive at new ideas which are not closely related to it.

"I felt that if I had a chance to go somewhere to spend some time thinking about it, I would come up with an idea for an experiment to try to detect the ether," Dr. Phillips said. He decided to devote less time to high-energy research and join a good university physics department, which would allow him time to pursue independent work; and in the fall of 1963, he accepted an offer to join the Washington University faculty.

While teaching courses at the University, he has commuted weekly to Argonne to work with an experimental group; but his main efforts have been to devise an ether experiment. As far as he knows, he is the only physicist planning an original experiment to determine the ether's presence.

Dr. Phillips has found that physicists are divided into three groups of opinion about his experiment. "The majority thinks that research such as mine—where the chances for a positive finding are quite slim—should be done. But they feel, 'better you than me.' " A small minority states that the project is unjustified in its scheme of priorities. A second, and equally small, minority has been impressed with the new theoretical evidence that an ether may exist, and enthusiastically supports the experiment. This group includes several leading theorists in high-energy physics.

Since Dr. Phillips came to the University, a number of developments have given him hope that his search will be fruitful. Physicists have developed new theories on the special properties of light; and from these calculations, one can deduce that the ether should not affect the velocity of light, and that the Michelson-Morley experiment definitely doesn't rule out the ether's existence. It also has been shown theoretically, Dr. Phillips points out, that a substance like the ether could carry the vibrations of electromagnetic forces. "At least, in the way I interpret current theory, light could very well be a ripple in the ether," he commented. Furthermore, a delicate experiment with the Brookhaven, Long Island, accelerator showed a totally unexpected breakdown, or decay, of subatomic particles called K-mesons. Dr. Phillips feels that this process also could have been due to the effects of an ether.
"Recent research has shown that the ether, if it exists, probably has properties like those of electrons in a superconductor," he continued. "Some metals, when cooled to near absolute zero, lose all their electrical resistance, and currents can flow in them indefinitely. Since 1957, we have known how to describe the arrangement of the electrons in this extraordinary situation. The ether can be discussed in similar mathematical terms."

As for designing an experiment to detect the ether, Dr. Phillips decided on magnetic effects as the most promising for his measurements. "One of the simplest effects of the motion of the earth through the ether would be to exert a twist on a magnet. The ether would try to turn the magnet into line with the motion. So a magnet would be under two distinct influences: the magnetic forces from the surrounding objects, and an additional force due to the movement of the earth in the ether. If we could reduce the first sufficiently, we would have a chance to measure the second," he explained.

How much must the magnetic forces be reduced? Dr. Phillips estimates that the strength of the ether's field will be about one-millionth of the earth's magnetic field, or about one billionth of the strength of the ordinary household magnet found in dime stores.

The problem of drastically diminishing extraneous magnetic fields (mainly the earth's field) is a frustrating one in any laboratory. While Professor Phillips was pondering the question with his students, Dorothy Woolum and Pat Lee, he received some valuable information from Professor Dan Bolef, a colleague in the physics department. Dr. Bolef knew of a specially designed laboratory—possibly a unique one—located at Oakland University, near Detroit. The laboratory, which is being used to measure the magnetic properties of alloys, is equipped to reduce the earth's magnetic field in a small volume by a factor of about 100,000.

Dr. Phillips approached the laboratory director, Gifford Scott, about the possibility of using the facility to make his measurements, and Mr. Scott said he'd be delighted to cooperate. "We are most grateful to the Oakland people. Without the use of their laboratory, our work might have been set back two or three years," Professor Phillips said.

A special instrument for use in conjunction with the Oakland equipment is being constructed by Dr. Phillips and his students, who have put in more than a year working on it. The device is called a torsion pendulum. Such instruments have a long history, and in different forms have been the basis of some of the most delicate experiments in physics. The sensitive part of Dr. Phillips' pendulum—the part it is hoped will be affected by the ether—is a simple bar magnet. The magnet is surrounded by a coil of wire, and is suspended by a fine wire in a chamber, which is evacuated to eliminate air turbulence in the surrounding area. By passing an electric current through the coil, the pendulum's sensitivity to magnetic fields is greatly reduced, though its reaction to the ether is not changed. This trick is necessary because the Oakland equipment does not reduce the surrounding magnetic fields quite far enough.

If Dr. Phillips' theory is correct, the magnet's response to the ether would still be so slight that it could be detected only by highly sensitive electronic circuits. With the rotation of the earth, the direction of the ether flow would change. The magnet would twist, first in one direction, then in the other, making one complete cycle every day.

A refrigeration unit to cool the coil around the magnet, and pumps to evacuate the magnet's container, will be assembled on an aluminum carriage. Within a few months, after the equipment is carefully checked out in Dr. Phillips' laboratory, it will be loaded on a truck and shipped to Oakland. Dr. Phillips will set it up in the low-field area of the Oakland laboratory and then watch to see if the magnet turns. Measurements over a period of months will be necessary to make sure that the effects are not due to such things as the heating of the laboratory during the day.

If the magnet doesn't turn in the anticipated rhythm?
"Frankly, I would be hard put to think of another way to look for the ether," he said.
If it does?
"The detection of the ether would require a fundamental revision of our way of understanding the physical world. The conflict between the points of view of Newton and Einstein could then be resolved, and it would be clear that neither man was completely right nor completely wrong. Newton's belief in an ether would be essentially correct, and Einstein's achievement would be the discovery of a language to describe electromagnetic and gravitational effects without ever mentioning the ether which lay behind them."

Proof of the existence of a universal medium, through which electromagnetic radiation and gravity is transmitted, would have a great impact on science. It would open an important new area of exploration in basic research; scientists would have to change their way of thinking about the physical universe, much in the same way people, long ago, had to change from looking at the earth as the center of the universe.
Dr. Phillips adjusts amplifier which measures the position of the pendulum to be used in his experiment to attempt to detect the “ether.”
The works of art presented on these pages might be interpreted as explorations of post-pop art possibilities. They are samples of the recent work of a gifted member of the Washington University faculty: Howard Jones, associate professor at the School of Fine Arts and a noted artist whose work has been exhibited nationally.

Jones is one of the originators of a new movement in art that he refers to as "light painting," in which illuminated bulbs are used in the same way that paint is employed in conventional art. The lighted bulbs, however, have a dimension that paint cannot share: the actuality, not just the illusion of movement.

Howard Jones joined the Washington University faculty in 1957, after teaching at Tulane and Florida State Universities. He studied painting in a four-year scholarship at Syracuse University and also attended Columbia University, the University of Toledo, and Cranbrook Academy. As important to his work, perhaps, as his academic training and his career as a teacher has been his wide experience in a variety of other fields. He spent three years as a fighter pilot in World War II, and has worked as a commercial artist, a stage designer, a television art director, and the producer and director of a traveling puppet show. Of these many experiences, Jones says, "I'm glad I didn't teach immediately. I made my peace with teaching later, but that contact with the commercial world was one of my most valuable experiences—to be involved with what life is, not what art was."

Jones arrived at light painting as a natural part of his development as an artist and his feeling that he had to have more than paint to become "more real, more intense, and involved." For his first effort in the new genre, he did more than two hundred sketches with colored crayon and India ink on graph paper before he bought his first miniature Christmas tree bulbs.

"Change is life and death," Jones says, "I want to create works that move the viewer biologically—that make him a witness to his own continuous presence on earth."

LIGHT PAINTER

HOWARD JONES
a “TIME BOX,” polychrome wooden box with electric lights and mirror. Thomas McGreevy collections.

b “ONE,” painted masonite panel, with flickering electric light and shadow in background. Jack Glenn collections.

c “EVA # 3,” folded light painting of polychrome wood with electric light and wheels. "Toys by Sculptors" show, Royal Marks Gallery, New York.

d “WITNESS,” three panels: mirror, ever-changing lights, and painted shadow panel. Yellow Transit Freight Lines collections.

f "NOW AND THEN LIGHT," two painted masonite panels with electric light bulbs in continually changing pattern.

g "MEANTIME," detail of painted masonite panels with electric light bulbs in continually changing pattern.

h "ESCALATION," three painted masonite panels with mirror and electric lights.
A long-standing goal of biochemists was achieved last year by Professor Sol Spiegelman of the University of Illinois, who synthesized infectious ribonucleic acid. He received his Ph.D. at Washington University and was a member of the faculty for several years before joining the University of Illinois in 1948. Last year, he was elected to membership in the National Academy of Sciences.

BREAKTHROUGH IN BIOLOGY

By ROGER SIGNOR
Office of Information

Last September 29, Professor Sol Spiegelman and his co-workers at the University of Illinois, Urbana, announced in the Proceedings of the National Academy of Sciences that they had done one of biology's most eagerly awaited experiments. For the first time, a biologically active genetic molecule had been made in a test tube. The molecule is the nucleic acid core of a virus and contains its genes. In the naturally occurring form, this particular type of virus infects bacteria and reproduces inside the living bacterial cell. After the formation of many viruses—each made up of a genetic molecule surrounded by a protein coat—the bacterial cell bursts and the new viruses go on to infect other cells. The viral nucleic acid manufactured in Spiegelman's experiment also infects bacterial cells.

For scientists to be able to observe such a fundamental process in a controlled laboratory experiment gives great impetus to the search for more precise understanding of how genes function and the methods to control viruses that infect man.

The day after the public announcement of his research achievement, Dr. Spiegelman scheduled a lecture at 4 p.m. on the Illinois campus to describe the experiment for students and faculty members. The lecture was given a formal, scientific title, "The Synthesis of a Self-Propagating and Infectious Nucleic Acid with a Purified Enzyme." This was in contrast to sensational newspaper headlines containing the guaranteed attention-getter, "life in a test tube" (which made Dr. Spiegelman wince).

Long before 4 o'clock, students—mostly undergraduates—filled the lecture room's 356 seats. Others took seats on the aisle steps, window ledges, or settled for standing room. It wasn't merely the dramatic newspaper stories that generated such a turnout for a scientific lecture. Dr. Spiegelman, in addition to his reputation for research achievements, is well known for his ability to explain his research in a lucid and meaningful way. One scientist has quipped, "He can make things clear not only to students, but even to colleagues."

He told the campus audience that he had not created "life in a test tube," as some of the newspapers had put it. He said, "For the first time, a system has been made available which permits the unambiguous analysis of the molecular basis underlying the replication of a self-propagating nucleic acid." What Dr. Spiegelman means by self-propagation is that the genetic molecule contains the information for making another replica of itself, and transmits this information to another entity—in his system, an enzyme—to make copies. "When you say you 'create' a living object the presumption is that the object didn't exist before. This we did not do. Working with simple chemical compounds, we take a primer of a living object and generate many living objects from it," he declared.

Dr. Spiegelman doesn't enjoy public appearances or publicity, but he feels the public has a right to know about research which they are helping to support through federal taxes. Although intensely absorbed in his research

Alumnus Dr. Sol Spiegelman, professor of microbiology at the University of Illinois.
BREAKTHROUGH IN BIOLOGY

For the record, Professor Spiegelman was born in 1914 in New York City, where his father taught in a rabbinical school. He went to the City College of New York, and enrolled in one biology course, but dropped it after two weeks because "it was very boring." He contends that most introductory biology courses are dull because too much purely descriptive material "is pushed down the student's throat before he has a feeling for the subject." As an undergraduate, he specialized in mathematics, but shifted to biology in graduate work at Columbia University because he developed a strong interest in the subject through extracurricular reading. He studied biology for two years at Columbia as a student of Dr. H. B. Steinbach (now head of the University of Chicago's zoology department); when Dr. Steinbach joined the Washington University faculty in 1941 Spiegelman followed him to St. Louis.

The change from mathematics to biology was the first of three critical shifts of focus in the Spiegelman career. The second came in Washington University's zoology department when he was studying for his Ph.D. under Professor Steinbach. Usually a Ph.D. candidate does research in the specialty of his supervisor, which in Steinbach's case was ion balance in cells. Spiegelman wanted to study gene function.

"After working about a year in his field, I went to Professor Steinbach and told him it wasn't the shortest route to what I wanted to know about cells. He said: 'go look at anything you want,'" Dr. Spiegelman recounted. "It wasn't unusual for Dr. Steinbach to permit his students this freedom. He is a remarkable person."

Dr. Spiegelman himself does not let conventional routines cramp his life's work: He arrives in his office late in the morning, but stays until midnight or later, supervising his own research, twenty graduate and postdoctoral students, and a seminar for advanced students. There are few interruptions during the late hours. In this respect, he concludes, "I've found it very advantageous to be out of time phase with society."

After Professor Steinbach gave the green light for his change of research, Dr. Spiegelman concentrated on yeast cells, simpler and more ideal organisms from which to get information on gene behavior. His Ph.D. thesis was among the first reports to show that a gene could be "turned on and off" with the aid of "inducers," which are usually simple organic compounds. During the Second World War, Dr. Spiegelman's Washington University group and a French laboratory were perhaps the only labs which maintained that the study of induced enzymes could lead to a better understanding of gene function, he recalled. The French researchers were headed by Jacques Monod, who shared the 1965 Nobel Prize for his induced enzyme research over the years. "He certainly deserved it," Dr. Spiegelman added.

This work during the war was the start of a very important development in the whole field, Dr. Spiegelman continued. "It gave biologists a tool with which they could really study the synthesis of a protein; one could turn the process on and off at will." When biologists learn precisely how genes are turned off and on "we will be in a better position to explain how a liver cell and a brain cell can both derive from the same ultimate source, the fertilized ovum," he said.

From 1944 to 1948, Dr. Spiegelman taught and did research in Washington University's School of Medicine as an assistant professor of bacteriology and immunology. He then joined the University of Illinois' microbiology department, where he has remained for the past 17 years.

In the 1950's, one of the Spiegelman research group's projects was the study of how the gene message is transmitted to the cell's synthetic machinery. Evidence was produced by many laboratories that the genes are contained in a complex nucleic acid molecule called deoxyribonucleic acid, or DNA. Spiegelman and his co-workers performed one of the definitive experiments on the "message idea," showing the broad outline of how information is carried from DNA to other points in the cell. They demonstrated that another nucleic acid, ribonucleic acid (RNA), "hybridized" with DNA. This form of RNA, called messenger RNA, is the substance which delivers instructions from DNA to the cell's cytoplasm, where functions such as protein synthesis take place. The hybridization experiment established that the messenger RNA is an identical copy of one of the two strands of which DNA is made.

In other words, DNA serves as a template for making RNA strands which are identical to one of two complementary strands of DNA. The RNA strands are then sent out as "programs" for protein synthesis.

During the 1950's Arthur Kornberg of the Washington University medical school faculty succeeded in synthesizing DNA, and Severo Ochoa (formerly of Washington University's department of pharmacology) of New York University synthesized RNA. Both Kornberg, now of Stanford University, and Ochoa received Nobel prizes. These experiments provided biologists with extremely valuable tools. But the fact remained that no one had yet proved that he could make biologically active nucleic acid.
“Clearly, it was important that someone had to do this,” Dr. Spiegelman said. “Until it was done, you just couldn’t know if you were really studying replication until you proved that replicas were in fact being produced.” Many biologists, including Spiegelman, tried for years to produce biologically active DNA, but to no avail.

“There remained, however, one group of organisms—a type of virus—which uses RNA as its genetic material. In 1960, we decided that it might be easier to do the experiment with RNA, which is a somewhat simpler system,” Dr. Spiegelman said. This was a third critical departure in Spiegelman’s career, and, again, it turned out to be a fortunate one.

There were many investigators working on the problem of synthesizing biologically active viral RNA, but the Spiegelman group decided on a new approach to the question. Contrary to the line of experimentation at the time, they felt that there had to be one specific enzyme which replicated with only one type of viral RNA. Spiegelman’s assumption stemmed from the fact that the viral RNA in these experiments was trying to replicate in the midst of thousands of other RNA molecules in cells they were infecting, and if the enzyme was not specific for the viral RNA molecule alone, then chances of its replication taking place at all were very slim.

Finally in 1963 they isolated an enzyme from cells infected with a virus called MS-2, and found that Spiegelman’s hunch was correct: the enzyme (named “replicase”) replicated RNA only in the presence of MS-2 viral RNA. This was an exciting development, but it was then critical to see if this property was unique to MS-2 virus. This virus is in a large family of viruses, called “bacteriophages,” which infect E. coli bacteria (a common bacteria found in the human intestine).

The Spiegelman team had learned valuable techniques in working with bacteriophages; they wanted to continue with them in their experiments, but could not find a virus unrelated to MS-2 on which to test replicase. They were close to the point of shifting to one of a number of much more complex animal or plant viruses, and therefore considerably more complex experimentation, when a happy accident occurred which presented them with the virus they needed.

Professor Itaro Watanabe of the University of Tokyo visited the Spiegelman laboratory in the summer of 1964, and told of a virus which attacked E. coli, but had a different type of RNA and protein (the viruses consist of a strand of RNA covered by a protein coat). This bacteriophage was called Q-beta virus. “Professor Watanabe was kind enough to send us a sample,” Dr. Spiegelman continued. “We purified the replicase for this virus and found that it obeyed the same rule as for MS-2; the enzyme replicated only its own RNA.”

The synthesis of infectious Q-beta RNA was then achieved by mixing (1) Q-beta replicase, (2) a bit of Q-beta RNA to start the copying process, (3) magnesium salts and (4) the chemically pure building blocks of RNA. How could Spiegelman be certain that the infectious RNA wasn’t produced by traces of the original RNA? Some of the RNA molecules made in one test tube were put in a second tube, where a new colony was produced. Then the process was repeated through fifteen test tubes.

“We have since gone beyond that point in the dilutions, but the answer is always the same,” Dr. Spiegelman said. In the fifteenth test tube, there is one chance in ten that one molecule of the original RNA virus is present. “Yet we found one million infectious particles in the last test tube; even if one molecule of the original RNA virus was present, it could account for only one of the one million particles,” he added. Synthesis of MS-2 virus was also successfully carried out.

Now it remains to define the precise chemical steps in the RNA virus’ replicative process. “I think we’ll know the answer in about a year; a number of other laboratories, of course, are working on the problem too,” he stated. The Spiegelman experiment has several other long-range implications. It brings biologists closer to synthesizing infectious DNA (DNA contains genes in plant and animal cells), and opens new areas of research with the goal of producing vaccines against the many viruses for which there is no protection.

Dr. Spiegelman is optimistic about prospects for defining the precise chemical steps of gene function in humans, and ultimately making it possible for man to correct specific genetic defects which lead to pathological conditions. This goal is far in the future, but could be realized in a relatively shorter period if society chose to increase expenditures of money in this area of research. “Advances in science often depend on the pressures by society to get the answer; our abilities in biology have increased enormously, and what problems are solved first depends largely on where we want to put the money.”

Many individuals express fear over the possibility of man having the power to manipulate genes, and rightly so, Dr. Spiegelman feels. He is hopeful that social mores will continue to control any misuse of such capability. “You must remember that we have not used the genetic knowledge we have had for many years to conduct controlled breeding in man. I think that this is a good thing because society doesn’t yet have the wisdom to make decisions on what kind of human beings we should produce,” he said.

“But I do feel that steps should now be taken to begin a serious discussion of the implications of our accumulating genetic knowledge for the future of man. Society must not find itself in the same position on this issue as it did when it was suddenly presented with an atomic bomb.”
School of Architecture assignments—called problems—often require weeks of work, occasionally are done by teams of two or more students... more often by individuals.

One down, two to go.
IF THE "NIGHT PEOPLE" ever take over the world, as a Pittsburgh disc jockey has for years urged his late-hour listeners to do, chances are that among the leaders of the takeover will be a Washington University alumnus.

He'll be wide awake and going strong while other heads are nodding, and he'll owe his nocturnal stamina to years of conditioning at his alma mater.

The indefatigable leader will undoubtedly be a graduate of the University's School of Architecture, whose lights in Givens Hall never go out. (If it weren't for a rule put into effect last year, closing the building at 2 o'clock each morning, the students would do the same—never go out. "Some of us have spent 72 straight hours up here," one student said.)

There are certainly students in other University divisions who burn the midnight oil on occasion, but none so incessantly as those in architecture. Night after night, year after year, the traffic in and out of Givens' second-floor drafting rooms for upperclassmen continues.

Chief reason for the night work is that few students—few practicing architects, in fact—can afford to own two sets of equipment, one at home, the other at school or office. While a liberal arts student often can complete an assignment in his dormitory room with only a book and a note pad, the architecture student needs drawing boards, t-squares, triangles, paper by the ton, lumber, and a lockerful of pens, pencils, and pen knives.

"Another reason," said one sixth-year man, "is that we all seem to put off until the last two weeks of an eight-week problem things we should have done the first six."

The young architect quickly qualified his self-deprecating answer by explaining that during the early weeks of a problem the student rejects one solution after another, in his mind, hoping eventually—before the deadline—to come up with his best effort. Once a student settles on a solution there remains the lengthy processes of finished drawings, models, and whatever other details are required on the project.

In the Givens' studios there exists a camaraderie not common in most other schools of the University. And a fair amount of nonsense too.

"One night somebody had a motorcycle up here roaring up and down the aisles," a student confessed. "And occasionally we have wars between the classes. Messy, but good for relieving tensions."

Tension there is, too, for while the percentage of freshmen who make it through to an architecture degree six years later is high, competition is high also—and a few each year fail to make the grade.

Those who make it to the advanced years have no choice but to come back to Givens after supper for hours of work. And although the building is now locked at 2 a.m., the lights are on nearly all night as janitors get the place ready for another day. Those lights are all the encouragement the most determined students need.

More than once, through mysterious methods known only to the hard workers, it's been back to the drawing board at 2:30 or 3. Maybe the Pittsburgh disc jockey is right. Night people like these can't be stopped.
A few minutes' break before heading back to the drawing board.

Horseplay—and occasional wars between classes—relieves tension during long hours of night work.
"Ouch!"
The wide range of emotions displayed on the preceding pages was recorded at a most unusual University function: a mass immunization party. The subjects are reacting—each in his own way—to the administration of flu and tetanus vaccine with an air gun.

More than 2000 persons—students, faculty, staff, and members of their families—filed through the basement of Prince Hall to receive flu and tetanus injections, a shot of oral polio vaccine, and the tuberculin Tine test. Everyone had his choice of taking any or all of the four vaccines and tests. Some, after a look at the air gun, decided not to take any.

The program was sponsored by the Samuel B. Grant University Health Service and the vaccines were provided by Lederle Laboratories division of American Cyanamid Company. Providing volunteer assistance with the program were students from five campus organizations: Student Assembly, Congress of the South Forty, Angel Flight, Petite Pershings, and the Physical Education Department. A repeat performance, to administer the second round of tetanus, flu, and polio vaccines, was scheduled for January.

The newly developed air gun, a formidable-looking bit of apparatus reputed to be far less painful than a hypodermic needle, was the cause of most of the apprehension and consternation shown on the faces of the participants. Fortunately, everyone of the 2000 survived.
"Ouch!"
Dr. Mary S. Calderone's opening address filled the Wohl Center lounge to capacity and was piped into adjoining rooms. After her main address, she talked to small groups and individually with students, faculty members, counselors, and campus religious leaders.
Let's Talk Sex

For three days this fall Washington University students talked sex. They talked with Dr. Mary S. Calderone, executive director of the Sex Information and Education Council of the United States, who was on campus as the University's first “physician in residence” at Forsyth Houses.

Dr. Calderone’s visit, sponsored by the Academic Committee of the Congress of the South Forty, was, in part, a reflection of the changed character of the University brought about by the ever-increasing residential population. It involved the University in concern for the development of its students as emotionally, as well as intellectually, mature individuals. It was an open, frank statement of the University's responsibility to provide an atmosphere of free inquiry into personal as well as academic problems.

From her first hour on campus the forceful, grey-haired physician invited students to this kind of free exchange of ideas. She took her meals with students, slept in the residence halls, met with students for everything from standing-room-only lectures to conference with individuals or couples. Students caught her enthusiasm for the kind of frankness on emotional problems that they heretofore had given to intellectual problems. She urged students to question her statements, to disagree, to tell her how they felt and why, and to talk sex with her, with each other, with counselors, and with professors. And they did. For three days sex permeated campus dialogue.

In her first major address on Thursday evening, Dr. Calderone urged students to rearrange and reopen their thoughts on sex and on its place in their lives.

"Sex is a total concept, the central core of every individual’s life," she said. “It is a potent force which, like any other potent force, each individual must learn to use, to fit into the responsible pattern of his or her life.

“Each individual must ask himself who and what am I, as an individual, as a man or a woman. How do I relate to others and how will I relate to one other individual? The answers to these questions, quite literally, form the basic sexual morality of any society. Today, individuals are not arriving at these answers by an orderly process. Our culture exploits sex on billboards and in communications media but it is unwilling to recognize sex as a vital life force and give youngsters the information necessary to make decisions on the total question of sex and life. What we have is sexual chaos with people making important decisions on the spur of the moment.
Dr. Calderone, a Quaker and daughter of photographer Edward Steichen, asked students to "reopen and re-evaluate" their attitudes on sex. She is executive director of the Sex Information and Education Council of the United States.
“Sexual responsibility is a social responsibility...it must be learned through reading, self-study, and self-awareness.

“We shall have to make decisions, not just once, but over and over again as to just how we shall use sex, in what manner we shall integrate it into our lives and our own relationships. These decisions are not so patently, ‘shall I or shan’t I,’ but, ‘who, why and how.’ If sex is casual, then the relationship is casual and the people involved are using each other casually and meaninglessly. But if the relationship is casual only to one and crucial to the other, then the first person is using the other as a thing, and this is the kind of human exploitation that past wars and present struggles have declared against.

“Sexual responsibility is a social responsibility. Like any other social responsibility it must be learned through reading, questioning, self-study, and self-awareness.”

Students reacted in intense curiosity, in hesitant questions, in antagonism, in bold challenges, in every way except apathy. That night many returned for a session that lasted another hour. Then Dr. Calderone moved on for a smaller discussion in one of the residence halls until well past midnight. Students began to talk to Dr. Calderone again early the next morning and sessions through Friday drew many new faces and many returnees.

On Saturday morning, after 36 hours of intense contact with students, Dr. Calderone returned to the lecture platform to close her visit.

“I hope you understand by now that I cannot give you the answers. Answers are different for each and must be made by each individual.

“Depending on the motivation and depth of character, there is an infinite number of ways in which men and women can use their sexuality to give depth, color, and creativity to all aspects of relationships in their lives. The range is infinite, from choosing the color of a dress, designing a bridge, leading a congregation, creating a symphony, or building a human relationship. And these are all as valid aspects of one’s sexuality as lovemaking, whether in laughter or in passion.

“If we accept sex as a fact of life and stop there, we have done a half-baked job. If sex is a fact of life, it is a way of life, by which we judge and can be judged.

“We are for the first time in history at a point where man can separate his sexual life from his reproductive life. Your generation can elect to go forward into new ways of looking at and managing sexuality. It must fit into the special meanings of your own lives and your own times. For, like atomic energy, sex is a potent force we must learn to use constructively or we can destroy ourselves.”
The pack takes off from the campus on a four-mile course. Leading the way is No. 49, Dave Romano, the fleet freshman from Rochester, N.Y. who placed first six times in eight intercollegiate cross-country meets.
MAYBE IT'S THE SOLITUDE that lures young men, even full-grown men, to compete in cross-country meets, or maybe it's the passing scenery they encounter while running four miles over the hills and through the trees. It might be the outdoor feeling they get while running in the brisk fall air. It may even be, as in the case of Washington University freshman Dave Romano, that they simply like to run.

Romano, a tall, lean 19-year-old from Rochester, N.Y., traveled all the way to Denmark last summer just to discover that running doesn't have to be a grind, but can be a lot of fun. While holding a summer job in Denmark, Romano joined a European running club and hasn't stopped running since. Running for the University team, he placed first six times in eight meets.

For obvious reasons, there is little fanfare connected with a cross-country meet—the spectators and cheerleaders (to say nothing of the band) can hardly run along with the team. However, with little spectator support except for a few staunch friends back at the finish line, Romano and company won their conference meet in St. Louis' Forest Park. While the runners receive coaching guidance and advice, the coach can hardly call the plays from the sidelines. "You can't drive a kid to run," says WU coach Les Avery.

Winning, while agreeable, doesn't seem to be the driving force behind the long-distance runner. Dave Romano, and thousands of runners like him, seem mainly to enjoy the scenery, the solitude, and the sheer joy of running.
These rambling remarks are being written during the last dying moments of 1965. We're at the typewriter instead of the wassail bowl this New Year's Eve because we came down with a flu bug a few days ago and are just recovering. It seemed an appropriate time to look back on the year that's just ending.

It was quite a year at Washington University at that. There have been 113 years in the University's history: some good, some bad, some routine, some important; but 1965 will have to rank among the most significant in that long history.

The biggest story of the year is one whose effects will be felt for not just years, but for decades to come: the announcement of the Seventy by Seventy Capital Program to raise $70,000,000 by 1970 for new facilities, new buildings, and future development of the University.

At year's end, the Capital Program is off to an excellent start. The most significant development so far has been the acceptance by many outstanding civic and business leaders of important positions in the campaign organization, both local and national. We can expect some dramatic announcements about the progress of the campaign early in 1966.

Another major event whose influence will be felt long past 1965 was the award to Washington University in June of a $15,000,000 challenge grant by the Ford Foundation, at the time the third largest single grant ever made by the Ford Foundation to any university.

The University received other important national recognition during the year. In May, a grant of nearly $4,000,000 to develop the University as one of the major science centers of the nation was announced by President Johnson. We were one of four universities to receive multimillion dollar grants under a new National Science Foundation program designed to develop new centers of scientific excellence throughout the country.

There were many distinguished campus visitors during the year. Two of the most important were here in February: Chief Justice Earl Warren, who gave the Founders Day address, and George Washington, AB '76, who arrived on horseback for the students' annual Washington's Birthday party in the Quadrangle.

The year 1965 might be described as a series of major triumphs laced with minor troubles. The many examples of national recognition we received made the headlines, but, like most other first-rate colleges and universities, we also made a certain amount of news with student picketing, demonstrations, petitions, and other evidence of the newly awakened interest of today's college students in the world about them.

At the end of 1965, one might have complained about student apathy, but not at the end of 1965. Today's students are interested in the world, involved in the world, and want to have something to say about how things are going in the world.

Also, like many other colleges and universities in the nation this year, Washington University was the scene of a "Teach-In" on the government's Viet Nam policy. We should all be proud that the participants in the "Teach-In" here showed a remarkable degree of maturity in sticking to the subject, arguing rationally, and permitting all sides of questions to be heard.

One of the most important events of the year was the appearance on campus of Vice President Hubert Humphrey. The Vice President's address drew a capacity crowd to the Field House, including thousands of students. It also attracted two small, but highly vocal, groups of pickets, one group protesting government policy in Viet Nam and one supporting it. While there was no objection to the peaceful picketing, the loud shouting and chanting of a small group of anti-war pickets interrupted the address, and resulted in a reprimand from the Vice President, a spate of unfavorable publicity, a "town meeting" discussion of student conduct, and a warning from Chancellor Eliot that no such discourtesy to visitors or interruptions of scheduled University events would be tolerated in the future.

Looking back, it was an exciting, busy, significant year, with more important events packed into the twelve months than we could even hope to list here. It was a year that saw the beginning of a whole new cycle of campus building, highlighted by the completion of the new Arthur Holly Compton Laboratory of Physics and the start of construction on the Monsanto Life Sciences Laboratory; a year in which the University received the maximum number of National Defense Education Act fellowships and a $4,250,000 U.S. Public Health grant to establish the first of a new kind of biological research and teaching center; and finally, a year in which the Battling Bears missed the College Athletic Conference football title literally by inches.

All in all, it was quite a year.

—FO'B